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REGIONAL DEEP HYPOTHERMIA PRESERVES NERVE CONDUCTION AND MYELIN SHEATHS INTEGRITY AFTER CONTUSIVE SPINAL CORD INJURY IN RATS: A SHORT-TERM AND PILOT STUDY

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BACKGROUND: Regional hypothermia has been suggested to be neuro-protective in central nervous system trauma such as brain and spinal cord injury. However, the underlying mechanisms are still not fully understood. In our previous study, we have demonstrated the neural-safety of deep hypothermia for regional interference. In the present study, we aim to further explore the effects of regional deep hypothermia on spinal cord conduction and myelin sheath integrity in a rat contusive spinal cord injury model.

METHODS: 14 male Sprague Dawley rats weighing 200-220g were randomized into three groups: Sham + Norm (n=5), SCI + Norm (n=5) and SCI + Hypo (n=4). Under general anesthesia, contusive spinal cord injury model was established using a 10g vessel clip at T10 level. Rats in sham group were only given laminectomy without spinal cord lesion. One hour after injury, focal hypothermia was induced in SCI + Hypo group by continuous epidural infusion of ice-cold saline in order to keep regional temperature at 17-18℃ for 2 hours. Spontaneous rewarming was allowed afterwards. Body-warm saline was used in the other two groups. At 3 days post-injury, all rats were anesthetized for spinal cord somatosensory-evoked potentials (SSEPs) recording. Animals were then sacrificed by overdose chloral hydrate injection, and spinal cord tissue were collected immedia

RESULTS: Focal epidural temperatures were successfully stabilized at 37℃ and 17-18℃ in normothermic and hypothermic groups respectively. SSEPs examination showed prolonged latencies and degraded amplitudes in SCI + Norm group, suggesting an obstacle in neural signal conduction. Such suppressions were clearly relieved in hypothermia treatment group. LFB staining further illustrated that vacuolization of myelin sheaths was significantly less in white matter within the injured centers after deep hypothermia treatment when compared with those in SCI + Norm group.

CONCLUSIONS: Current explorations suggested that regional deep hypothermia was able to preserve conduction of neural signals and ameliorate myelin sheaths death after contusive spinal cord injury, indicating that regional hypothermia may protect spinal cord from demyelination.